

## PATENT ABSTRACTS OF JAPAN

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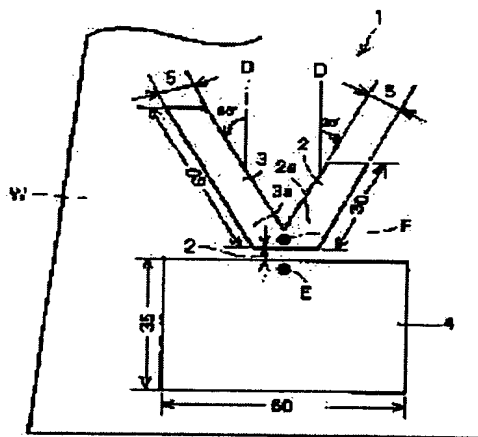
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## (54) FREQUENCY SWITCHING TYPE GLASS ANTENNA

## (57)Abstract:

PURPOSE: To provide the frequency switching type glass antenna which can be provided in a space being in common with a monopole antenna, and also, dispenses with a switching member.

CONSTITUTION: The glass antenna 1 is formed by coupling each one end of a first radiation pattern 2 and a second radiation pattern 3 of each different length and providing them in a V-shape against the vertical direction of the glass surface W, and providing a ground pattern 4 in the lower part of this V-shape pattern. Also, to the lower end part F of the V-shape pattern, a core wire of a feeding coaxial cable is connected, and to the center part E of the upper end of the ground pattern 4, a braided wire of the cable is connected, and the other end of the cable is connected to an antenna terminal of a mobile telephone. According to this constitution, it is possible to resonate two different frequencies. Also, a switching member is not required. Moreover, since the ground pattern 4 is shared, this glass antenna can be provided in a space being in common with a monopole antenna as a whole.



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**CLAIMS**

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[Claim(s)]

[Claim 1] The frequency change-over type glass antenna characterized by having combined the ends of the pattern for the 1st radiation and the pattern for the 2nd radiation with which die length differs, having arranged in the shape of V character to the vertical direction of a glass side, and arranging the pattern for touch-down under this V character-like pattern.

[Claim 2] The frequency change-over type glass antenna according to claim 1 characterized by arranging said pattern for the 1st and 2nd radiation in the shape of U character to the vertical direction of a glass side.

[Claim 3] The die length of said pattern for the 1st radiation is made into abbreviation  $(1/4)\lambda_1$  to the 1st wavelength  $\lambda_1$ . The die length of said pattern for the 2nd radiation is made into abbreviation  $(1/5)\lambda_2$  - abbreviation  $(1/4)\lambda_2$  to the 2nd wavelength  $\lambda_2$ . The frequency change-over type glass antenna according to claim 1 or 2 characterized by having made vertical lay length of said pattern for touch-down into abbreviation  $(1/4)\lambda_1$  - abbreviation  $(1/4)\lambda_2$ , and making the die length of the longitudinal direction of said pattern for touch-down into abbreviation  $(1/4)\lambda_2$  - abbreviation  $(3/4)\lambda_1$ .

[Claim 4] The frequency change-over type glass antenna according to claim 1 or 2 characterized by making said pattern for radiation, or said pattern for touch-down into the configuration of extraction.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to amelioration of the glass antenna mainly arranged by the windowpane of a car.

[0002]

[Description of the Prior Art] The pattern Fig. of the windowpane antenna (application-for-utility-model-registration Taira No. 38628 [ four to ]) for which these people applied as an example of the conventional windowpane antenna is shown in drawing 12 . This windowpane antenna 80 arranges the pattern 81 for radiation in the vertical direction of a glass side, and arranges the pattern 82 for touch-down which carried out the configuration of extraction caudad. And the core wire of the coaxial cable for electric supply was connected to lower limit section 81a of the pattern 81 for radiation, the braided wire of the coaxial cable for electric supply was connected to upper limit center-section 82a of the pattern 82 for touch-down, and the other end of this cable was connected to the antenna terminal of land mobile radiotelephone equipment or radio.

[0003] Thus, since the antenna was formed in the glass side, a height like a whip antenna was able to be lost and the air resistance at the time of car transit was able to be reduced. Moreover, it was suitable also in respect of the improvement in an appearance.

[0004]

[Problem(s) to be Solved by the Invention] However, this windowpane antenna 80 must already carry out lot preparation of the antenna, in order to use on a frequency which is different since it was the so-called monopole antenna (antenna for single frequency). However, the double tooth space was required to arrange 2 sets of monopole antennas in the windowpane of one sheet, and separately, also when change-over members (for example, a short circuit member or a change-over switch etc.) were required, it was in the change of an antenna. Then, the purpose of this invention is to offer the frequency change-over type glass antenna which can arrange in about the same tooth space as a monopole antenna, and does not need a change-over member.

[0005]

[Means for Solving the Problem] In order to solve said technical problem, this invention combined the ends of the pattern for the 1st radiation and the pattern for the 2nd radiation with which die length differs, was arranged in the shape of V character to the vertical direction of a glass side, and arranged the pattern for touch-down under this V character-like pattern.

[0006] Said pattern for the 1st and 2nd radiation may be arranged in the shape of U character to the vertical direction of a glass side.

[0007] The die length of said pattern for the 1st radiation is made into abbreviation  $(1/4)\lambda_1$  to the 1st wavelength  $\lambda_1$ . The die length of said pattern for the 2nd radiation is made into abbreviation  $(1/5)\lambda_2$  - abbreviation  $(1/4)\lambda_2$  to the 2nd wavelength  $\lambda_2$ . Vertical lay length of said pattern for touch-down is made into abbreviation  $(1/4)\lambda_1$  - abbreviation  $(1/4)\lambda_2$ , and it is good also considering the die length of the longitudinal direction of said pattern for touch-down as abbreviation  $(1/4)\lambda_2$  - an abbreviation  $(3/4)\lambda_1$ .

[0008] It is good also considering said pattern for radiation, or said pattern for touch-down as a configuration of extraction.

[0009]

[Function] Since the ends of two patterns for radiation with which die length differs were combined, two

different frequencies can be resonated. Moreover, it is necessary to form neither a short circuit member nor a change-over switch in a frequency change-over. On the other hand, since the pattern for touch-down was made common use, if the point of having added one pattern for radiation lining up side-by-side is removed, it will hardly change a configuration with a monopole antenna. Therefore, magnitude can also be carried out just like a monopole antenna, and can be arranged in a comparatively narrow tooth space.

[0010] If the pattern for both radiation is arranged in the shape of U character, the flare to right and left will decrease and space-saving will become possible.

[0011] The frequency characteristics near a monopole antenna can be acquired by setting up the magnitude of the pattern for radiation, and the pattern for touch-down according to certain conditions.

[0012] Improvement in a field of view can be aimed at by making the pattern for radiation, or the pattern for touch-down into the configuration of extraction.

[0013]

[Example] Hereafter, it explains, referring to an accompanying drawing about the example of this invention. In addition, although the antenna for a 800MHz band and 1.5GHz bands is explained, it is not limited to these frequencies.

[0014] Drawing 1 is the antenna pattern Fig. of the 1st example of the frequency change-over type glass antenna concerning this invention. The 1st example is equivalent to invention of claim 1. It comes to arrange the pattern 4 for touch-down long in all directions in the lower part of this V character-like pattern while the frequency change-over type glass antenna 1 is longwise, and it combines the pattern 2 for the 1st radiation and the pattern 3 for the 2nd radiation with which die length differs in each of lower limit sections 2a and 3a and arranging it in the shape of V character to the vertical direction of posterior part windowpane W, such as a car. In addition, although mentioned later, E by the side of the feeding point and the pattern for touch-down of F by the side of the pattern for radiation is a grounding point.

[0015] Moreover, said pattern 2 for the 1st radiation set said pattern 3 for the 2nd radiation as the include angle of 30 degrees counterclockwise to said vertical directional axis D at the include angle of 30 degrees to the vertical directional axis D of glass clockwise. In addition, it cannot be overemphasized that an include angle is not limited to 30 degrees, but it can be set as arbitration. Moreover, a pattern 2 and 3 each may be set as a different include angle.

[0016] Drawing 2 is the block diagram of the electric supply section of said glass antenna 1. Core wire 6a of the coaxial cable 6 for electric supply is connected to the bond part F of lower limit section 2a of said pattern for the 1st radiation, and lower limit section 3a of said pattern for the 2nd radiation, braided-wire 6b for touch-down of said cable 6 is connected to the upper limit center section E of said pattern 4 for touch-down (4a, 4a), and the other end of said cable 6 is connected to the antenna terminal of non-illustrated land mobile radiotelephone equipment or radio.

[0017] Thus, two different frequencies can be resonated from having prepared the feeding point in the bond part F of said radial patterns 2 and 3. Moreover, it is necessary to form neither a short circuit member nor a change-over switch in a frequency change-over. On the other hand, since said pattern 4 for touch-down was made common use, if the point of having added one of said patterns 2 and 3 for radiation lining up side-by-side is removed, it will hardly change a configuration with a monopole antenna. Therefore, magnitude can also be carried out just like a monopole antenna, and can be arranged in a comparatively narrow tooth space.

[0018] Drawing 3 is the antenna pattern Fig. of the 2nd example of the frequency change-over type glass antenna concerning this invention. The 2nd example is equivalent to invention of claim 2. It comes to arrange the pattern 14 long in all directions for touch-down in the lower part of this U character-like pattern while the frequency change-over type glass antenna 11 is longwise, arranges in abbreviation parallel the pattern 12 for the 1st radiation and the pattern 13 for the 2nd radiation with which die length differs at intervals of about 3mm, it makes it extend in the direction which faces, combines the lower-limit sections 12a and 13a of said patterns 12 and 13 and arranges them in the shape of U character.

[0019] namely, the 2nd example -- the include angle of said patterns 2 and 3 for the 1st and 2nd radiation of the 1st example -- 30 degrees to 0 times -- changing -- the dimension of a pattern -- abbreviation -- it is the same. Moreover, the same is said of the point of having prepared the feeding point in the bond part F of the lower limit sections 12a and 13a of said patterns 12 and 13 for radiation, and having established the grounding point in the upper limit center section E of said \*\* value pattern 14.

[0020] On the other hand, the dimension of each pattern is decided with the relation shown below. The relation of the dimension of this pattern is equivalent to invention of claim 3. That is, if wavelength to resonance frequency  $f$  (Hz) is set to  $\lambda$  (m), wavelength will be called for by the degree type.

[0021]

[Equation 1]  $\lambda = (c/f) - k$  [0022] However, it is the fractional shortening (0.6) of a glass antenna [ in / c, and / in k / this example ]. [ the velocity of light (3.108m/s.) ]

[0023] According to this several 1, the wavelength  $\lambda_1$  to 1.5GHz is set to 0.12m. By the way, the die length of said patterns 2 and 12 for the 1st radiation is set as abbreviation (1/4)  $\lambda_1$  to this  $\lambda_1$ .

Therefore, both the die length of said patterns 2 and 12 for the 1st radiation is set to 30mm.

[0024] The wavelength  $\lambda_2$  to 800MHz is similarly set to 0.225m from several 1. By the way, the die length of said patterns 3 and 13 for the 2nd radiation is set as abbreviation (1/4)  $\lambda_2$  to these  $\lambda_2$ . Therefore, although both the die length of said patterns 3 and 13 for the 2nd radiation was set to 0.05625m, it was set to 0.06m, i.e., 60mm, for convenience by this example.

[0025] Moreover, the width of face of said patterns 2 and 12 for the 1st radiation and the patterns 3 and 13 for the 2nd radiation set spacing of 5mm, these patterns 2, 3, 12, and 13 for radiation, and said patterns 4 and 14 for touch-down as 2mm.

[0026] On the other hand, to wavelength  $\lambda_1$  and  $\lambda_2$ , the vertical lay length of said patterns 4 and 14 for touch-down is set as abbreviation (1/4)  $\lambda_1$  - abbreviation (1/4)  $\lambda_2$ , and the die length of the longitudinal direction of said patterns 4 and 14 for touch-down is set as abbreviation (1/4)  $\lambda_2$  - abbreviation (3/4)  $\lambda_1$ . That is, vertical lay length sets up so that it may go into about 30mm thru/or about 56mm, and the range whose die length of a longitudinal direction is about 56mm thru/or about 90mm. In this example, the die length of 35mm and a longitudinal direction was set as 60mm for vertical lay length.

[0027] A frequency-characteristics graph [ as opposed to the 800MHz band of the 1st and 2nd examples in drawing 4 ], a frequency-characteristics graph [ as opposed to the 1.5GHz band of the 1st and 2nd examples in drawing 5 ], drawing 6 , and drawing 7 are the measurement data (for reference) of the frequency characteristics of the 1st and 2nd examples.

[0028] Among drawing, 800M criterion is the case where it is the monopole antenna whose resonance frequency is 800MHz among the windowpane antennas of said conventional example, and 1.5G criterion is the case where it is the monopole antenna whose resonance frequency is 1.5GHz among the windowpane antennas of said conventional example. Moreover, common use (deg=0) is the case where the include angle of two patterns for radiation is 0 times, i.e., the 2nd example, common use (deg=15) is the case where the include angle to the vertical directional axis D of two patterns for radiation is 15 degrees, and common use (deg=30) is the case where the include angle to the vertical directional axis D of two patterns for radiation is 30 degrees, i.e., the 1st example.

[0029] According to drawing 4 , it is common use (deg=0) that the gain nearest to 800M criterion is acquired, and, subsequently, it is the order of common use (deg=15) and common use (deg=30). Moreover, the common use (deg=30) of the gain of common use (deg=15) and common use (deg=30) above center frequency (880MHz) is a little lower with the down side which spreads abbreviation etc. However, compared with 800M criterion, the fall of gain is 2dB of abbreviation, and, also in the case of common use (deg=30), can be called practically sufficient property.

[0030] According to drawing 5 , it is common use (deg=0) that the gain nearest to 1.5G criterion is acquired, and, subsequently, it is the order of common use (deg=30) and common use (deg=15). However, compared with 1.5G criterion, the falls of gain are 1 thru/or 2dB, and, also in the case of common use (deg=15), can be called practically sufficient property.

[0031] Thus, common use (deg=0) shows the property nearest to a standard antenna on any frequency. Moreover, it is difficult to be in the inclination for 15 degrees of gain to be a little higher with a 800MHz band in 15 include angles and 30 comparisons, and for gain to become [ the direction of 30 degrees ] high a little conversely with a 1.5GHz band, and to define the relation between an include angle and gain quantitatively.

[0032] In addition, although the include angle of the pattern for radiation could be arbitrary, the comparatively good result was able to be obtained in the range which is 0 times thru/or 30 degrees.

[0033] According to the above measurement result, when the include angle which the pattern for both radiation makes was changed, it turned out that gain changes. Therefore, if the relation between gain and the include

angle of the pattern for radiation is investigated beforehand, it will become possible to arrange the pattern for radiation at the optimal include angle.

[0034] On the other hand, the frequency characteristics near a monopole antenna can be acquired by setting up the dimension of the pattern for radiation, and the pattern for touch-down according to certain conditions.

[0035] Drawing 8 is the antenna pattern Fig. of the 3rd example. This 3rd example is made to transform the 1st example. The frequency change-over type glass antenna 21 consists of the large pattern 24 for touch-down of width of face with which it was arranged under two patterns 22 and 23 for radiation arranged in the vertical direction by V typeface, and these patterns 22 and 23, and lower side 24a was formed in the shape of radii comparatively. Side 24a of this bottom is made to meet the bottom edge Wa of posterior part windowpane W, and if said pattern 22 thru/or 24 is arranged in the corner of windowpane W as a whole, a field of view can be raised.

[0036] Drawing 9 is the antenna pattern Fig. of the 4th example. This 4th example is equivalent to what made the pattern for radiation the configuration of extraction among invention of claim 4. The frequency change-over type glass antenna 31 consists of two patterns 32 and 33 for radiation arranged in the vertical direction in the shape of V character, and the pattern 34 for touch-down arranged under these patterns 32 and 33. Furthermore, since abbreviation parallel were made to arrange three thin electric conduction wire rods and said radial patterns 32 and 33 formed them, they become extraction-like. Therefore, said radial patterns 32 and 33 stop being able to be conspicuous easily, and improvement in a field of view can be aimed at.

[0037] Drawing 10 is the antenna pattern Fig. of the 5th example. The 5th example is equivalent to what made the pattern for touch-down the configuration of extraction among invention of claim 4. The frequency change-over type glass antenna 41 consists of two patterns 42 and 43 for radiation arranged in the vertical direction by V typeface, and the pattern 44 for touch-down arranged under these patterns 42 and 43. Since this pattern 44 for touch-down is formed in the shape of extraction, it stops being able to be conspicuous easily, therefore it can aim at improvement in a field of view.

[0038] Drawing 11 is the antenna pattern Fig. of the 6th example. The 6th example is equivalent to what made both pattern for radiation, and pattern for touch-down the shape of extraction among invention of claim 4. The frequency change-over type glass antenna 51 consists of two patterns 52 and 53 for radiation arranged in the vertical direction in the shape of V character, and the pattern 54 for touch-down of the shape of extraction arranged under these patterns 52 and 53. Furthermore, since abbreviation parallel were made to arrange each pattern and it formed three thin electric conduction wire rods, each pattern itself becomes extraction-like. Therefore, the patterns 52 and 53 for radiation and the pattern 54 for touch-down stop being able to be conspicuous easily, and improvement in a field of view can be aimed at more than in the 4th or the 5th example.

[0039] In addition, it cannot be overemphasized that the number of the lead-wire wire rods in the 5th and 6th examples is good by the number not only of three but arbitration. Moreover, the 3rd thru/or the 6th example can be similarly carried out to U character-like the pattern for radiation.

[0040]

[Effect of the Invention] Since the ends of two patterns for radiation with which die length differs were combined, two different frequencies can be resonated. Moreover, it is necessary to form neither a short circuit member nor a change-over switch in a frequency change-over. On the other hand, since the pattern for touch-down was made common use, if the point of having added one pattern for radiation lining up side-by-side is removed, it will hardly change a configuration with a monopole antenna. Therefore, magnitude can also be carried out just like a monopole antenna, and can be arranged in a comparatively narrow tooth space.

[0041] If the pattern for both radiation is arranged in the shape of U character, the flare to right and left will decrease and space-saving will become possible.

[0042] The frequency characteristics near a monopole antenna can be acquired by setting up the magnitude of the pattern for radiation, and the pattern for touch-down according to certain conditions.

[0043] Improvement in a field of view can be aimed at by making the pattern for radiation, or the pattern for touch-down into the configuration of extraction.

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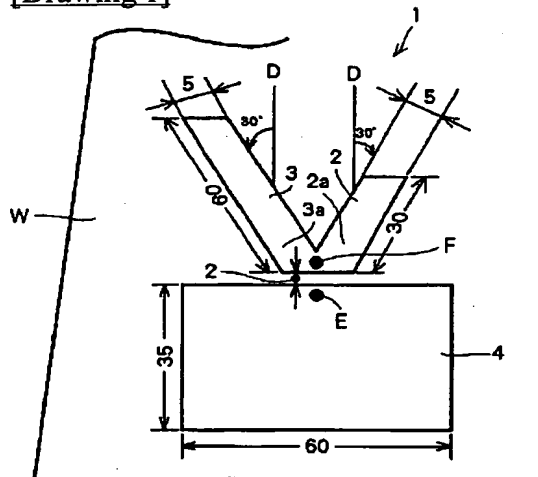
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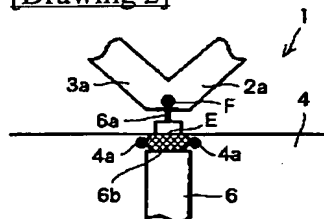
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## DRAWINGS

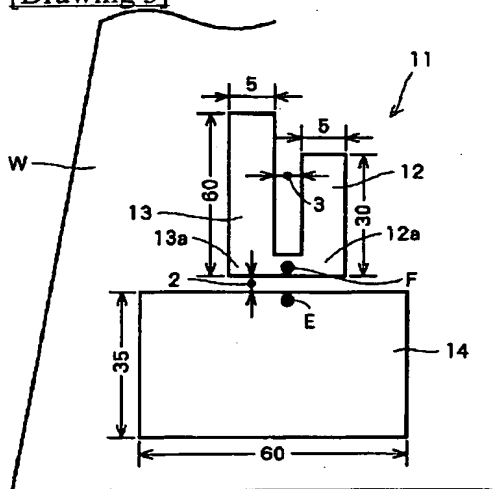
[Drawing 1]



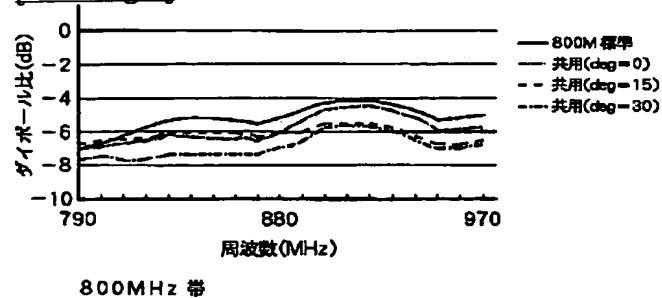
[Drawing 2]



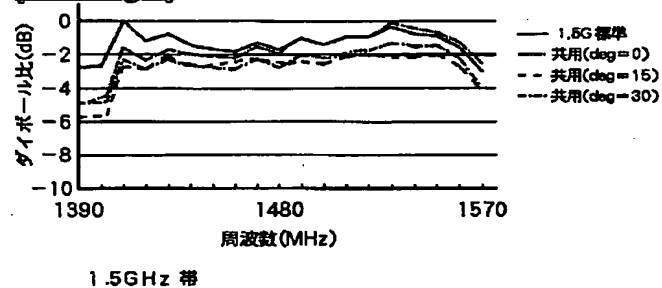
[Drawing 3]



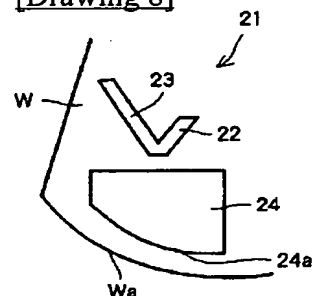
[Drawing 4]



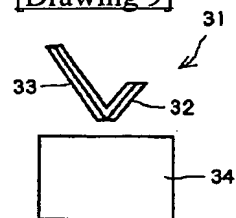
[Drawing 5]



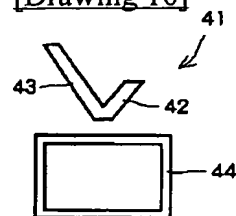
[Drawing 8]



[Drawing 9]



[Drawing 10]



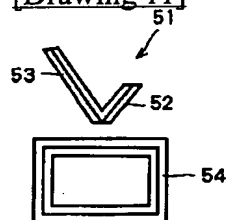
[Drawing 6]



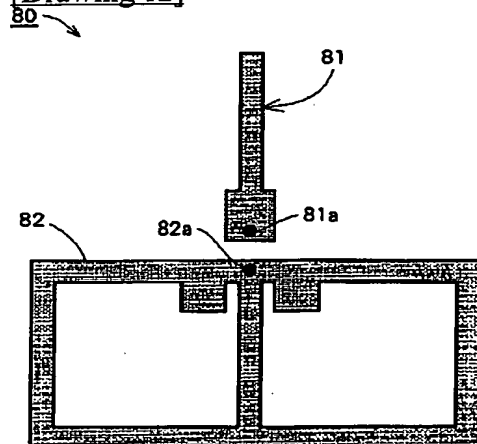
(単位 dB、ダイポール比)

周波数(MHz)	800M 標準	共用 (deg=0)	共用 (deg=15)	共用 (deg=30)
790.0	-7.0	-6.9	-6.8	-7.6
800.0	-6.4	-6.8	-6.5	-7.5
810.0	-6.1	-6.8	-6.4	-7.6
820.0	-5.7	-6.7	-6.3	-7.5
830.0	-5.3	-6.3	-5.9	-7.3
840.0	-5.2	-6.4	-5.9	-7.3
850.0	-5.2	-6.4	-5.9	-7.3
860.0	-5.4	-6.5	-6.0	-7.3
870.0	-5.6	-6.6	-6.3	-7.4
880.0	-5.1	-6.0	-6.1	-6.9
890.0	-4.7	-5.5	-5.9	-6.5
900.0	-4.3	-4.9	-5.6	-5.9
910.0	-4.1	-4.7	-5.5	-5.7
920.0	-4.1	-4.6	-5.5	-5.6
930.0	-4.4	-4.9	-5.8	-6.0
940.0	-4.8	-5.3	-6.3	-6.6
950.0	-5.3	-5.8	-6.8	-7.1
960.0	-5.3	-5.8	-6.8	-7.1
970.0	-5.1	-5.6	-6.6	-6.7
平均	-5.2	-5.9	-6.2	-6.9

[Drawing 11]



[Drawing 12]



[Drawing 7]

(単位 dB、ダイポール比)

周波数(MHz)	1.5G 標準	共用 (deg=0)	共用 (deg=15)	共用 (deg=30)
1390.0	-2.5	-4.9	-5.6	-4.9
1400.0	-2.4	-4.4	-5.4	-4.9
1410.0	-0.1	-1.7	-2.6	-2.3
1420.0	-1.0	-2.2	-2.9	-2.9
1430.0	-0.7	-1.6	-1.9	-2.3
1440.0	-1.3	-1.9	-2.7	-2.6
1450.0	-1.7	-2.1	-2.6	-2.9
1460.0	-1.8	-2.2	-2.4	-3.0
1470.0	-1.3	-1.6	-2.5	-2.4
1480.0	-1.8	-2.0	-2.6	-2.8
1490.0	-1.1	-1.1	-2.5	-2.0
1500.0	-1.4	-1.4	-2.6	-2.2
1510.0	-0.9	-0.9	-2.1	-1.8
1520.0	-0.8	-0.7	-1.9	-1.7
1530.0	-0.2	-0.1	-2.2	-1.2
1540.0	-0.5	-0.3	-2.2	-1.4
1550.0	-0.4	-0.2	-2.0	-1.3
1560.0	-1.3	-1.0	-2.7	-2.2
1570.0	-3.2	-2.6	-4.3	-4.0
平均	-1.3	-1.7	-2.8	-2.6

[Translation done.]

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CORRECTION OR AMENDMENT

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[Kind of official gazette] Printing of amendment by the convention of 2 of Article 17 of Patent Law  
 [Section partition] The 3rd partition of the 7th section  
 [Publication date] April 13, Heisei 13 (2001. 4.13)

[Publication No.] JP,6-291530,A  
 [Date of Publication] October 18, Heisei 6 (1994. 10.18)  
 [Annual volume number] Open patent official report 6-2916  
 [Application number] Japanese Patent Application No. 5-77163  
 [The 7th edition of International Patent Classification]

H01Q 1/32  
 1/48  
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[FI]

H01Q 1/32 A  
 1/48  
 21/30

[Procedure revision]  
 [Filing Date] February 1, Heisei 12 (2000. 2.1)  
 [Procedure amendment 1]  
 [Document to be Amended] Specification  
 [Item(s) to be Amended] Claim  
 [Method of Amendment] Modification  
 [Proposed Amendment]  
 [Claim(s)]

[Claim 1] The frequency change-over type glass antenna characterized by for the longitudinal direction to have combined the ends of the pattern for the 1st radiation of predetermined length, and the pattern for the 2nd radiation of predetermined length with which a longitudinal direction differs from the pattern for the 1st radiation, to have arranged the pattern for the 1st and 2nd radiation in the shape of V character to the vertical direction along a glass side, and to arrange the pattern for touch-down in the flection lower part of a V character-like pattern.

[Claim 2] The frequency change-over type glass antenna characterized by for the longitudinal direction to have combined the ends of the pattern for the 1st radiation of predetermined length, and the pattern for the 2nd radiation of predetermined length with which a longitudinal direction differs from the pattern for the 1st radiation, to have arranged the pattern for the 1st and 2nd radiation in the shape of U character to the vertical direction along a glass side, and to arrange the pattern for touch-down in the flection lower part of a U character-like pattern.

[Claim 3] The die length of said pattern for the 1st radiation is made into abbreviation (1/4) lambda 1 to the 1st wavelength lambda 1. The die length of said pattern for the 2nd radiation is made into abbreviation (1/5)

lambda 2 - abbreviation (1/4) lambda 2 to the 2nd wavelength lambda 2. The frequency change-over type glass antenna according to claim 1 or 2 characterized by having made vertical lay length of said pattern for touch-down into abbreviation (1/4) lambda 1 - abbreviation (1/4) lambda 2, and making the die length of the longitudinal direction of said pattern for touch-down into abbreviation (1/4) lambda 2 - abbreviation (3/4) lambda 1.

[Claim 4] The frequency change-over type glass antenna according to claim 1 or 2 characterized by making said pattern for radiation, or said pattern for touch-down into the configuration of extraction.

[Procedure amendment 2]

[Document to be Amended] Specification

[Item(s) to be Amended] 0005

[Method of Amendment] Modification

[Proposed Amendment]

[0005]

[Means for Solving the Problem] The frequency change-over type glass antenna applied to claim 1 of this invention in order to solve said technical problem A longitudinal direction combines the ends of the pattern for the 1st radiation of predetermined length, and the pattern for the 2nd radiation of predetermined length with which a longitudinal direction differs from the pattern for the 1st radiation. The pattern for the 1st and 2nd radiation is arranged in the shape of V character to the vertical direction along a glass side, and the pattern for touch-down is arranged in the flection lower part of a V character-like pattern.

[Procedure amendment 3]

[Document to be Amended] Specification

[Item(s) to be Amended] 0006

[Method of Amendment] Modification

[Proposed Amendment]

[0006] A longitudinal direction combines the ends of the pattern for the 1st radiation of predetermined length, and the pattern for the 2nd radiation of predetermined length with which a longitudinal direction differs from the pattern for the 1st radiation, and arranges the pattern for the 1st and 2nd radiation in the shape of U character to the vertical direction along a glass side, and the frequency change-over type glass antenna concerning claim 2 of this invention arranges the pattern for touch-down in the flection lower part of a U character-like pattern.

[Procedure amendment 4]

[Document to be Amended] Specification

[Item(s) to be Amended] 0009

[Method of Amendment] Modification

[Proposed Amendment]

[0009]

[Function] Since the ends of two patterns for radiation with which die length differs were combined according to the frequency change-over type glass antenna concerning claim 1, two different frequencies can be resonated. Moreover, it is necessary to form neither a short circuit member nor a change-over switch in a frequency change-over. On the other hand, since the pattern for touch-down was made common use, if the point of having added one pattern for radiation lining up side-by-side is removed, it will hardly change a configuration with a monopole antenna. Therefore, magnitude can also be carried out just like a monopole antenna, and can be arranged in a comparatively narrow tooth space.

[Procedure amendment 5]

[Document to be Amended] Specification

[Item(s) to be Amended] 0010

[Method of Amendment] Modification

[Proposed Amendment]

[0010] Since according to the frequency change-over type glass antenna concerning claim 2 the 1st and 2nd radiation patterns are paralleled and it can arrange, the flare to a longitudinal direction decreases and space-saving becomes possible.

[Procedure amendment 6]

[Document to be Amended] Specification

[Item(s) to be Amended] 0019

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[Method of Amendment] Modification

[Proposed Amendment]

[0019] namely, the 2nd example -- the include angle of said patterns 2 and 3 for the 1st and 2nd radiation of the 1st example -- 30 degrees to 0 times -- changing -- the dimension of a pattern -- abbreviation -- it is the same. Moreover, the same is said of the point of having prepared the feeding point in the bond part F of the lower limit sections 12a and 13a of said patterns 12 and 13 for radiation, and having established the grounding point in the upper limit center section E of said touch-down pattern 14.

[Procedure amendment 7]

[Document to be Amended] Specification

[Item(s) to be Amended] 0041

[Method of Amendment] Modification

[Proposed Amendment]

[0041] If the pattern for both radiation is arranged in the shape of U character, since the 1st and 2nd radiation patterns are paralleled and it can arrange, the flare to right and left decreases and space-saving becomes possible. Moreover, the gain nearest to [ in a large UHF band ] a standard antenna is acquired.

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[Translation done.]

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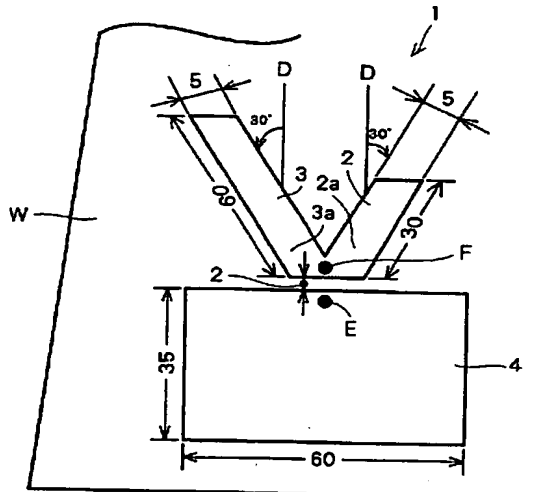
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(54)【発明の名称】 周波数切換式ガラスアンテナ

(57)【要約】

【目的】 モノポールアンテナ並みのスペースに配設でき、且つ切換部材を必要としない周波数切換式ガラスアンテナを提供すること。

【構成】 長さの異なる第1放射用パターン2と第2放射用パターン3との一端同士を結合させガラス面Wの上下方向に対しV字状に配設し、このV字状パターンの下方に接地用パターン4を配設してガラスアンテナ1を形成した。又、V字状パターン下端部Fに給電用同軸ケーブルの芯線を接続し、接地用パターン4の上端中央部Eに前記ケーブルの編組線を接続し、前記ケーブルの他端を自動車電話のアンテナ端子に接続した。この構成によれば異なる2つの周波数に共振させることができる。しかも切換部材を必要としない。又、接地用パターン4を共用にしたため全体としてモノポールアンテナ並みのスペースに配設できる。



## 【特許請求の範囲】

【請求項1】 長さの異なる第1放射用パターンと第2放射用パターンとの一端同士を結合させガラス面の上下方向に対しV字状に配設し、このV字状パターンの下方に接地用パターンを配設したことを特徴とする周波数切換式ガラスアンテナ。

【請求項2】 前記第1及び第2放射用パターンをガラス面の上下方向に対しU字状に配設したことを特徴とする請求項1記載の周波数切換式ガラスアンテナ。

【請求項3】 前記第1放射用パターンの長さを第1の波長 $\lambda_1$ に対し約 $(1/4)\lambda_1$ とし、前記第2放射用パターンの長さを第2の波長 $\lambda_2$ に対し約 $(1/5)\lambda_2 \sim$ 約 $(1/4)\lambda_2$ とし、前記接地用パターンの上下方向の長さを約 $(1/4)\lambda_1 \sim$ 約 $(1/4)\lambda_2$ とし、前記接地用パターンの左右方向の長さを約 $(1/4)\lambda_2 \sim$ 約 $(3/4)\lambda_1$ としたことを特徴とする請求項1又は2記載の周波数切換式ガラスアンテナ。

【請求項4】 前記放射用パターン又は前記接地用パターンを中抜き形状としたことを特徴とする請求項1又は2記載の周波数切換式ガラスアンテナ。

## 【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、主に車両の窓ガラスに配設されるガラスアンテナの改良に関する。

【0002】

【従来の技術】従来の窓ガラスアンテナの一例として本出願人が出願した窓ガラスアンテナ（実願平4-38628号）のパターン図を図12に示す。この窓ガラスアンテナ80は、ガラス面の上下方向に放射用パターン81を配設し、下方に中抜きの形状をした接地用パターン82を配設したものである。そして、放射用パターン81の下端部81aに給電用同軸ケーブルの芯線を接続し、接地用パターン82の上端中央部82aに給電用同軸ケーブルの編組線を接続し、このケーブルの他端を自動車電話装置やラジオのアンテナ端子に接続していた。

【0003】このようにアンテナをガラス面に形成したので、ホイップアンテナのような突起部がなくなり、車両走行時の空気抵抗を低減させることができた。又、外觀上の面でも好適であった。

【0004】

【発明が解決しようとする課題】ところがこの窓ガラスアンテナ80は所謂モノポールアンテナ（単一周波数用アンテナ）であったため、異なる周波数で用いるためにはアンテナをもう一組用意しなければならなかった。しかし、1枚の窓ガラスに二組のモノポールアンテナを配設するには倍のスペースが必要であり、又、アンテナの切換えに別途切換部材（例えば、短絡部材または切換スイッチ等）が必要な場合もあった。そこで本発明の目的は、モノポールアンテナ並みのスペースに配設でき、且つ切換部材を必要としない周波数切換式ガラスアンテナ

を提供することにある。

【0005】

【課題を解決するための手段】前記課題を解決するために本発明は、長さの異なる第1放射用パターンと第2放射用パターンとの一端同士を結合させガラス面の上下方向に対しV字状に配設し、このV字状パターンの下方に接地用パターンを配設した。

【0006】前記第1及び第2放射用パターンをガラス面の上下方向に対しU字状に配設してもよい。

10 【0007】前記第1放射用パターンの長さを第1の波長 $\lambda_1$ に対し約 $(1/4)\lambda_1$ とし、前記第2放射用パターンの長さを第2の波長 $\lambda_2$ に対し約 $(1/5)\lambda_2 \sim$ 約 $(1/4)\lambda_2$ とし、前記接地用パターンの上下方向の長さを約 $(1/4)\lambda_1 \sim$ 約 $(1/4)\lambda_2$ とし、前記接地用パターンの左右方向の長さを約 $(1/4)\lambda_2 \sim$ 約 $(3/4)\lambda_1$ としてもよい。

【0008】前記放射用パターン又は前記接地用パターンを中抜きの形状としてもよい。

【0009】

20 【作用】長さの異なる2つの放射用パターンの一端同士を結合させたので、異なる2つの周波数に共振させることができる。又、周波数切換用に短絡部材や切換スイッチ等を設ける必要がない。一方、接地用パターンは共用にしたので放射用パターンを横並びに1本追加した点を除くとモノポールアンテナと殆ど構成が変わらない。従って、大きさもモノポールアンテナ並みにすることができ比較的狭いスペースに配設できる。

【0010】両放射用パターンをU字状に配設すると左右への拡がり少なくなり省スペースが可能となる。

30 【0011】放射用パターン及び接地用パターンの大きさを一定の条件に従って設定することによりモノポールアンテナに近い周波数特性を得ることができる。

【0012】放射用パターン又は接地用パターンを中抜きの形状にすることにより視界の向上を図ることができる。

【0013】

【実施例】以下、本発明の実施例について添付図面を参照しながら説明する。尚、800MHz帯及び1.5GHz帯用アンテナについて説明するがこれらの周波数に

40 限定されるものではない。

【0014】図1は本発明に係る周波数切換式ガラスアンテナの第1実施例のアンテナパターン図である。第1実施例は請求項1の発明に相当する。周波数切換式ガラスアンテナ1は、縦長で長さが異なる第1放射用パターン2と第2放射用パターン3とを夫々の下端部2a、3aで結合させ、車両等の後部窓ガラスWの上下方向に対しV字状に配設するとともに、このV字状パターンの下方に縦横に長い接地用パターン4を配設してなる。尚、後述するが放射用パターン側のFは給電点、接地用パターン側のEは接地点である。

【0015】又、前記第1放射用パターン2はガラスの上下方向軸Dに対し時計方向に30度の角度に、前記第2放射用パターン3は前記上下方向軸Dに対し反時計方向に30度の角度に設定した。尚、角度は30度に限定されず任意に設定できることはいうまでもない。又、パターン2、3夫々を異なる角度に設定してもよい。

【0016】図2は前記ガラスアンテナ1の給電部の構成図である。前記第1放射用パターン2の下端部2aと前記第2放射用パターン3の下端部3aの結合部Fには給電用同軸ケーブル6の芯線6aが接続され、前記接地用パターン4の上端中央部E(4a、4a)には前記ケーブル6の接地用編組線6bが接続され、前記ケーブル6の他端は不図示の自動車電話装置やラジオのアンテナ端子に接続される。

【0017】このように前記放射状パターン2、3の結合部Fに給電点を設けたことから、異なる2つの周波数に共振させることができる。又、周波数切換用に短絡部材や切換スイッチ等を設ける必要がない。一方、前記接地用パターン4は共用にしたので前記放射用パターン2、3を横並びに1本追加した点を除くとモノポールアンテナと殆ど構成が変わらない。従って、大きさもモノポールアンテナ並みにすることができ比較的狭いスペースに配設できる。

【0018】図3は本発明に係る周波数切換式ガラスアンテナの第2実施例のアンテナパターン図である。第2実施例は請求項2の発明に相当する。周波数切換式ガラスアンテナ11は、縦長で長さが異なる第1放射用パターン12と第2放射用パターン13とを約3mmの間隔で略平行に配設し、前記パターン12、13の下端部12a、13aを相対する方向に延出させて結合しU字状に配設するとともに、このU字状パターンの下方に縦横に長い接地用パターン14を配置してなる。

【0019】即ち、第2実施例は第1実施例の前記第1及び第2放射用パターン2、3の角度を30度から0度に変更したものであり、パターンの寸法は略同じである。又、前記放射用パターン12、13の下端部12a、13aの結合部Fに給電点を設け、前記接地用パターン14の上端中央部Eに接地点を設けた点も同様である。

【0020】一方、各パターンの寸法は次に示す関係により決められる。このパターンの寸法の関係が請求項3の発明に相当する。即ち、共振周波数 $f$ (Hz)に対する波長を $\lambda$ (m)とすると、波長は次式により求められる。

【0021】

$$【数1】 \lambda = (c/f) \cdot k$$

【0022】但し、 $c$ は光速( $3 \cdot 10^8$  m/s.)、 $k$ は本実施例におけるガラスアンテナの短縮率(0.6)である。

【0023】この数1によれば、1.5GHzに対する

波長 $\lambda$ は0.12mとなる。ところで前記第1放射用パターン2、12の長さはこの $\lambda$ 1に対し約(1/4) $\lambda$ 1に設定する。従って、前記第1放射用パターン2、12の長さは共に30mmとなる。

【0024】同様にして数1より800MHzに対する波長 $\lambda$ 2は0.225mとなる。ところで前記第2放射用パターン3、13の長さはこの $\lambda$ 2に対し約(1/4) $\lambda$ 2に設定する。従って、前記第2放射用パターン3、13の長さは共に0.05625mとなるが本実施例では便宜上0.06m、即ち、60mmに設定した。

【0025】又、前記第1放射用パターン2、12及び第2放射用パターン3、13の幅は5mm、これらの放射用パターン2、3、12、13と前記接地用パターン4、14との間隔は2mmに設定した。

【0026】一方、波長 $\lambda$ 1及び $\lambda$ 2に対し前記接地用パターン4、14の上下方向の長さを約(1/4) $\lambda$ 1〜約(1/4) $\lambda$ 2に、前記接地用パターン4、14の左右方向の長さを約(1/4) $\lambda$ 2〜約(3/4) $\lambda$ 1に設定する。即ち、上下方向の長さが約30mm乃至約56mm、左右方向の長さが約56mm乃至約90mmの範囲に入るよう設定する。本実施例では上下方向の長さを35mm、左右方向の長さを60mmに設定した。

【0027】図4は第1及び第2実施例の800MHz帯に対する周波数特性グラフ、図5は第1及び第2実施例の1.5GHz帯に対する周波数特性グラフ、図6、図7は第1及び第2実施例の周波数特性の測定データ(参照用)である。

【0028】図中、800M標準とは前記従来例の窓ガラスアンテナのうち共振周波数が800MHzのモノポールアンテナの場合であり、1.5G標準とは前記従来例の窓ガラスアンテナのうち共振周波数が1.5GHzのモノポールアンテナの場合である。又、共用(deg=0)とは2つの放射用パターンの角度が0度、即ち第2実施例の場合であり、共用(deg=15)とは2つの放射用パターンの上下方向軸Dに対する角度が15度の場合であり、共用(deg=30)とは2つの放射用パターンの上下方向軸Dに対する角度が30度、即ち第1実施例の場合である。

【0029】図4によれば、800M標準に最も近い利得が得られるのは共用(deg=0)であり、次いで共用(deg=15)、共用(deg=30)の順である。又、中心周波数(880MHz)より上側では共用(deg=15)と共用(deg=30)の利得は略等しく、下側では共用(deg=30)の方がやや低い。しかし、共用(deg=30)の場合でも800M標準に比べ利得の低下は略2dBであり実用上十分な特性といえる。

【0030】図5によれば、1.5G標準に最も近い利得が得られるのは共用(deg=0)であり、次いで共用(deg=30)、共用(deg=15)の順であ



る。しかし、共用 ( $\text{deg} = 15$ ) の場合でも 1.5 GHz 標準に比べ利得の低下は 1 乃至 2 dB であり実用上十分な特性といえる。

【0031】このように共用 ( $\text{deg} = 0$ ) が何れの周波数でも標準アンテナに最も近い特性を示す。又、角度 15 度と 30 度との比較では、800 MHz 帯では 15 度の方がやや利得が高く、1.5 GHz 帯では逆に 30 度の方がやや利得が高くなる傾向にあり角度と利得の関係を定量的に定めるのは難しい。

【0032】尚、放射用パターンの角度は任意でよいが 0 度乃至 30 度の範囲において比較的良好な結果を得ることができた。

【0033】以上の測定結果によれば、両放射用パターンのなす角度を変えると利得が変わることが分った。従って、予め利得と放射用パターンとの角度との関係を調べておけば放射用パターンを最適な角度で配設することが可能となる。

【0034】一方、放射用パターン及び接地用パターンの寸法を一定の条件に従って設定することによりモノポールアンテナに近い周波数特性を得ることができる。

【0035】図 8 は第 3 実施例のアンテナパターン図である。この第 3 実施例は第 1 実施例を変形させたものである。周波数切換式ガラスアンテナ 21 は、上下方向に V 字形に配設された 2 本の放射用パターン 22、23 と、このパターン 22、23 の下方に配設され下側の辺 24a が円弧状に形成された比較的幅の広い接地用パターン 24 とから成る。この下側の辺 24a を、例えば後部窓ガラス W の下側縁部 Wa に沿わせ、前記パターン 22 乃至 24 を全体として窓ガラス W の隅に配設すれば視界を向上させることができる。

【0036】図 9 は第 4 実施例のアンテナパターン図である。この第 4 実施例は請求項 4 の発明のうち放射用パターンを中抜き形状にしたものに相当する。周波数切換式ガラスアンテナ 31 は、上下方向に V 字形に配設された 2 本の放射用パターン 32、33 と、このパターン 32、33 の下方に配設された接地用パターン 34 とから成る。更に、前記放射状パターン 32、33 は 3 本の細い導電線材を略平行に配列させて形成したため中抜き状となる。従って、前記放射状パターン 32、33 が目立ち難くなり視界の向上を図ることができる。

【0037】図 10 は第 5 実施例のアンテナパターン図である。第 5 実施例は請求項 4 の発明のうち接地用パターンを中抜き形状にしたものに相当する。周波数切換式ガラスアンテナ 41 は、上下方向に V 字形に配設された 2 本の放射用パターン 42、43 と、このパターン 42、43 の下方に配設された接地用パターン 44 から成る。この接地用パターン 44 は中抜き状に形成されているため目立ち難くなり、従って視界の向上を図ることができる。

【0038】図 11 は第 6 実施例のアンテナパターン図

である。第 6 実施例は請求項 4 の発明のうち放射用パターン及び接地用パターンの両者を中抜き形状にしたものに相当する。周波数切換式ガラスアンテナ 51 は、上下方向に V 字形に配設された 2 本の放射用パターン 52、53 と、このパターン 52、53 の下方に配設された中抜き状の接地用パターン 54 とから成る。更に、各パターンは 3 本の細い導電線材を略平行に配列させて形成したため各パターン自体も中抜き状となる。従って、放射用パターン 52、53 及び接地用パターン 54 とともに目立ち難くなり第 4 又は第 5 実施例以上に視界の向上を図ることができる。

【0039】尚、第 5 及び第 6 実施例における導電線材の数は 3 本に限らず任意の数でよいことはいうまでもない。又、第 3 乃至第 6 実施例は U 字形の放射用パターンに対しても同様に実施できる。

【0040】

【発明の効果】長さの異なる 2 つの放射用パターンの一端同士を結合させたので、異なる 2 つの周波数に共振させることができる。又、周波数切換用に短絡部材や切換スイッチ等を設ける必要がない。一方、接地用パターンは共用にしたので放射用パターンを横並びに 1 本追加した点を除くとモノポールアンテナと殆ど構成が変わらない。従って、大きさもモノポールアンテナ並みにすることができ比較的狭いスペースに配設できる。

【0041】両放射用パターンを U 字形に配設すると左右への拡がり少なくなり省スペースが可能となる。

【0042】放射用パターン及び接地用パターンの大きさを一定の条件に従って設定することによりモノポールアンテナに近い周波数特性を得ることができる。

【0043】放射用パターン又は接地用パターンを中抜きの形状にすることにより視界の向上を図ることができる。

【図面の簡単な説明】

【図 1】本発明に係る周波数切換式ガラスアンテナの第 1 実施例のアンテナパターン図

【図 2】同ガラスアンテナの給電部の構成図

【図 3】同ガラスアンテナの第 2 実施例のアンテナパターン図

【図 4】同ガラスアンテナの第 1 及び第 2 実施例の周波数特性グラフ (800 MHz 帯)

【図 5】同ガラスアンテナの第 1 及び第 2 実施例の周波数特性グラフ (1.5 GHz 帯)

【図 6】同ガラスアンテナの第 1 及び第 2 実施例のアンテナの周波数特性の測定データ (800 MHz)

【図 7】同ガラスアンテナの第 1 及び第 2 実施例のアンテナの周波数特性の測定データ (1.5 GHz)

【図 8】同ガラスアンテナの第 3 実施例のアンテナパターン図

【図 9】同ガラスアンテナの第 4 実施例のアンテナパターン図

【図10】同ガラスアンテナの第5実施例のアンテナパターン図

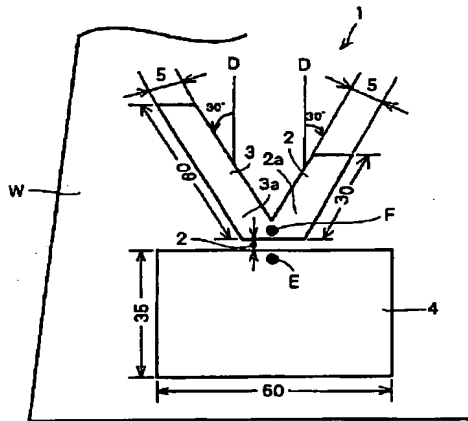
【図11】同ガラスアンテナの第6実施例のアンテナパターン図

【図12】従来の窓ガラスアンテナのパターン図

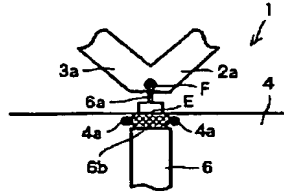
【符号の説明】

\* 1, 11, 21, 31, 41, 51...周波数切換式ガラスアンテナ、2, 12, 22, 32, 42, 52...第1放射用パターン、3, 13, 23, 33, 43, 53...第2放射用パターン、2a, 3a, 12a, 13a...下端部、4, 14, 24, 34, 44, 54...接地用パターン。  
\* 接地用パターン。

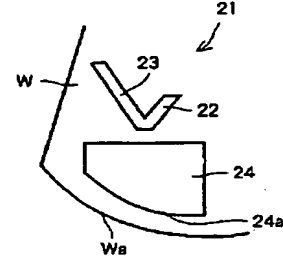
【図1】



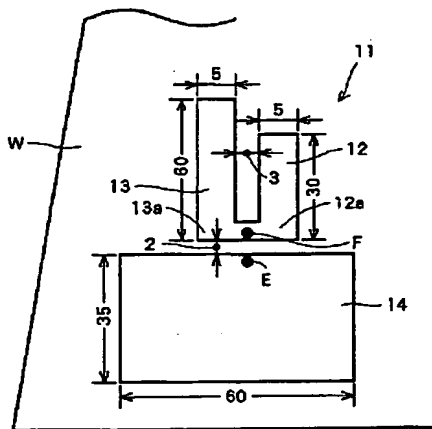
【図2】



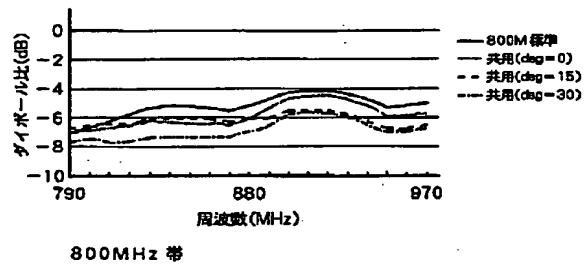
【図8】



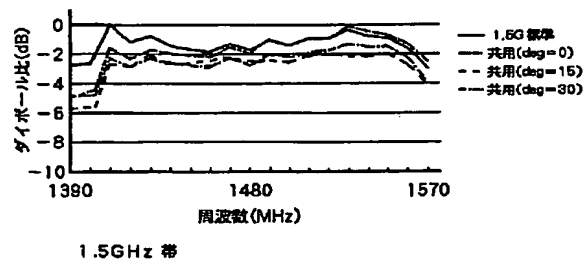
【図3】



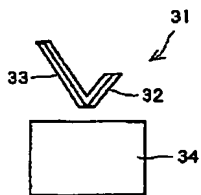
【図4】



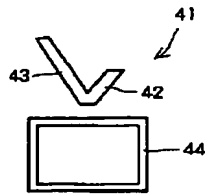
【図5】



【図9】



【図10】

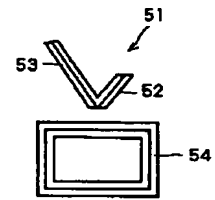


【図6】

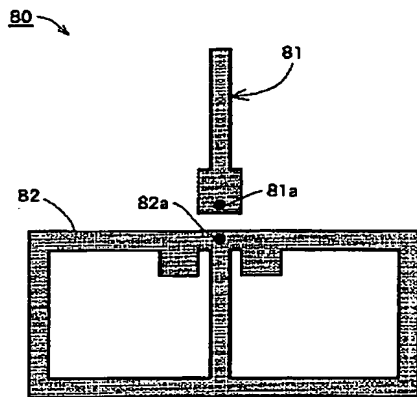
(単位 dB、ダイポール比)

周波数(MHz)	800M 標準	共用 (deg=0)	共用 (deg=15)	共用 (deg=30)
790.0	-7.0	-6.9	-6.8	-7.6
800.0	-6.4	-6.8	-6.5	-7.5
810.0	-6.1	-6.8	-6.4	-7.6
820.0	-5.7	-6.7	-6.3	-7.5
830.0	-5.3	-6.3	-5.9	-7.3
840.0	-5.2	-6.4	-5.9	-7.3
850.0	-5.2	-6.4	-5.9	-7.3
860.0	-5.4	-6.5	-6.0	-7.3
870.0	-5.6	-6.6	-6.3	-7.4
880.0	-5.1	-6.0	-6.1	-6.9
890.0	-4.7	-5.5	-5.9	-6.5
900.0	-4.3	-4.9	-5.6	-5.9
910.0	-4.1	-4.7	-5.5	-5.7
920.0	-4.1	-4.6	-5.5	-5.6
930.0	-4.4	-4.9	-5.8	-6.0
940.0	-4.8	-5.3	-6.3	-6.6
950.0	-5.3	-5.8	-6.8	-7.1
960.0	-5.3	-5.8	-6.8	-7.1
970.0	-5.1	-5.6	-6.6	-6.7
平均	-5.2	-5.9	-6.2	-6.9

【図11】



【図12】



【図7】

(単位 dB、ダイボール比)

周波数(MHz)	1.5G 標準	共用 (deg=0)	共用 (deg=15)	共用 (deg=30)
1390.0	-2.5	-4.9	-5.6	-4.9
1400.0	-2.4	-4.4	-5.4	-4.9
1410.0	-0.1	-1.7	-2.6	-2.3
1420.0	-1.0	-2.2	-2.9	-2.9
1430.0	-0.7	-1.6	-1.9	-2.3
1440.0	-1.3	-1.9	-2.7	-2.6
1450.0	-1.7	-2.1	-2.6	-2.9
1460.0	-1.8	-2.2	-2.4	-3.0
1470.0	-1.3	-1.6	-2.5	-2.4
1480.0	-1.8	-2.0	-2.6	-2.8
1490.0	-1.1	-1.1	-2.5	-2.0
1500.0	-1.4	-1.4	-2.6	-2.2
1510.0	-0.9	-0.9	-2.1	-1.8
1520.0	-0.8	-0.7	-1.9	-1.7
1530.0	-0.2	-0.1	-2.2	-1.2
1540.0	-0.5	-0.3	-2.2	-1.4
1550.0	-0.4	-0.2	-2.0	-1.3
1560.0	-1.3	-1.0	-2.7	-2.2
1570.0	-3.2	-2.6	-4.3	-4.0
平均	-1.3	-1.7	-2.8	-2.6

【公報種別】特許法第17条の2の規定による補正の掲載  
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【F1】

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【手続補正書】  
 【提出日】平成12年2月1日(2000.2.1)  
 【手続補正1】  
 【補正対象書類名】明細書  
 【補正対象項目名】特許請求の範囲  
 【補正方法】変更  
 【補正内容】  
 【特許請求の範囲】

【請求項1】 長手方向が所定長の第1放射用パターンと、長手方向が第1放射用パターンとは異なる所定長の第2放射用パターンとの一端同士を結合させ、第1および第2放射用パターンをガラス面に沿った上下方向に対しV字状に配設し、V字状パターンの屈曲部下方に接地用パターンを配設したことを特徴とする周波数切換式ガラスアンテナ。

【請求項2】 長手方向が所定長の第1放射用パターンと、長手方向が第1放射用パターンとは異なる所定長の第2放射用パターンとの一端同士を結合させ、第1および第2放射用パターンをガラス面に沿った上下方向に対しU字状に配設し、U字状パターンの屈曲部下方に接地用パターンを配設したことを特徴とする周波数切換式ガラスアンテナ。

【請求項3】 前記第1放射用パターンの長さを第1の波長 $\lambda_1$ に対し約 $(1/4)\lambda_1$ とし、前記第2放射用パターンの長さを第2の波長 $\lambda_2$ に対し約 $(1/5)\lambda_2 \sim$ 約 $(1/4)\lambda_2$ とし、前記接地用パターンの上下方向の長さを約 $(1/4)\lambda_1 \sim$ 約 $(1/4)\lambda_2$ とし、前記接地用パターンの左右方向の長さを約 $(1/4)\lambda_2 \sim$ 約 $(3/4)\lambda_1$ としたことを特徴とする請求項1又は2記載の周波数切換式ガラスアンテナ。

【請求項4】 前記放射用パターン又は前記接地用パターンを中抜き形状としたことを特徴とする請求項1又は2記載の周波数切換式ガラスアンテナ。

【手続補正2】  
 【補正対象書類名】明細書  
 【補正対象項目名】0005  
 【補正方法】変更  
 【補正内容】  
 【0005】

【課題を解決するための手段】前記課題を解決するため本発明の請求項1に係る周波数切換式ガラスアンテナは、長手方向が所定長の第1放射用パターンと、長手方向が第1放射用パターンとは異なる所定長の第2放射用パターンとの一端同士を結合させ、第1および第2放射用パターンをガラス面に沿った上下方向に対しV字状に配設し、V字状パターンの屈曲部下方に接地用パターンを配設したものである。

【手続補正3】  
 【補正対象書類名】明細書  
 【補正対象項目名】0006  
 【補正方法】変更  
 【補正内容】

【0006】本発明の請求項2に係る周波数切換式ガラスアンテナは、長手方向が所定長の第1放射用パターンと、長手方向が第1放射用パターンとは異なる所定長の第2放射用パターンとの一端同士を結合させ、第1および第2放射用パターンをガラス面に沿った上下方向に対しU字状に配設し、U字状パターンの屈曲部下方に接地用パターンを配設したものである。

【手続補正4】  
 【補正対象書類名】明細書  
 【補正対象項目名】0009  
 【補正方法】変更  
 【補正内容】  
 【0009】

【作用】請求項1に係る周波数切換式ガラスアンテナによれば、長さの異なる2つの放射用パターン的一端同士を結合させたので、異なる2つの周波数に共振させることができる。又、周波数切換用に短絡部材や切換スイッチ等を設ける必要がない。一方、接地用パターンは共用にしたので放射用パターンを横並びに1本追加した点を除くとモノポールアンテナと殆ど構成が変わらない。従って、大きさもモノポールアンテナ並みにすることができ比較的狭いスペースに配設できる。

【手続補正5】

【補正対象書類名】明細書

【補正対象項目名】0010

【補正方法】変更

【補正内容】

【0010】請求項2に係る周波数切換式ガラスアンテナによれば、第1および第2放射パターンどうしを平行させて配置できるため、左右方向への拡がりが少なくなり省スペースが可能となる。

【手続補正6】

【補正対象書類名】明細書

【補正対象項目名】0019

【補正方法】変更

【補正内容】

【0019】即ち、第2実施例は第1実施例の前記第1及び第2放射用パターン2、3の角度を30度から0度に変更したものであり、パターンの寸法は略同じである。又、前記放射用パターン12、13の下端部12a、13aの結合部Fに給電点を設け、前記接地パターン14の上端中央部Eに接地点を設けた点も同様である。

【手続補正7】

【補正対象書類名】明細書

【補正対象項目名】0041

【補正方法】変更

【補正内容】

【0041】両放射用パターンをU字状に配設すると、第1および第2放射パターンどうしを平行させて配置できるため、左右への拡がりが少なくなり省スペースが可能となる。また、広いUHF帯域で標準アンテナに最も近い利得が得られる。

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